INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2003	**Park:** Shenandoah NP
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Additional investigators or key field assistants (first name, last name, office phone, office email):

No co-investigators

Permit#:
SHEN-2003-SCI-0004

Park-assigned Study Id. #:
SHEN-00133

Project Title:
GEOLOGIC EVOLUTION OF MESOPROTEROZOIC BASEMENT, BLUE RIDGE PROVINCE, SHENANDOAH NATIONAL PARK, VIRGINIA

Permit Start Date: Mar 01, 2003	**Permit Expiration Date** Feb 28, 2004
Study Start Date: Mar 01, 2003	**Study End Date** Feb 28, 2010

Study Status:
Continuing

Activity Type:
Research

Subject/Discipline:
Geology / General

Objectives:

The primary objective of this study is the determination of detailed geologic, petrologic, and geochronologic relationships characterizing metamorphic and igneous basement rocks of Mesoproterozoic age exposed in the Blue Ridge geologic province within Shenandoah National Park. The project involves detailed field mapping and an integrated program of petrographic, geochemical, and isotopic analyses designed to elucidate petrologic and temporal aspects of the Grenville orogeny.

Findings and Status:

During the past year, progress in this research project includes: (1) expanded field mapping and sampling of geologic units, (2) petrographic analysis of thin section samples, (3) major- and trace-element geochemical analyses of selected whole-rock samples, and (4) U-Pb isotopic analyses of zircons from four of the mapped lithologic units. To date, field mapping, undertaken both within the Park and in contiguous adjoining areas, has elucidated the areal extent and mutual geologic relationships of basement rocks in the Thornton Gap, Old Rag Mountain, Fletcher, Chester Gap, and Big Meadows 7.5-minute quadrangles. During the past year, mapping and sampling efforts were concentrated on basement rocks located within the Big Meadows quadrangle. The mapping throughout the entire area has demonstrated the existence of fourteen major lithologic units including different types of charnockite, various gneisses, and leucocratic granitoids. New isotopic analyses of eight lithologic units has delineated the timing relationships of geologic events in the area collectively spanning an interval of 100 m.y. These geologic events, which collectively define the Grenville orogeny in the northern Blue Ridge province, include at least three periods of magmatism and a major period of deformation and metamorphism. These newly established relationships constitute the first detailed chronology of Grenville-age orogenesis based on integrated studies involving field, petrologic, and isotopic investigations. Moreover, this research is providing detailed mapping of rock distribution and compositions throughout much of the Park area. Such studies should provide a firm quantitative basis for understanding soil distribution and the effects of soil composition on plant health and diversity and on environmental concerns such as buffering capabilities. Studies planned for 2004 include: (1) continued field mapping and petrographic analysis of rocks in the northern part of the study area, (2) major- and trace-element geochemical analyses of additional whole-rock samples and (3) U-Pb isotopic analyses of zircons from key lithologic units.

This research project has become part of a collaborative effort involving scientists from the U.S. Geological Survey and Virginia Division of Mineral Resources designed to produced multi-disciplinary resource maps for Shenandoah National Park. A major product from this research will be a new geologic map of the National Park, supported by new field and analytical data.

Reports Produced:

Tollo, R.P., Aleinikoff, J.N., and Borduas, E.A., in press, Petrology and geochronology of Grenville-age magmatism, Blue Ridge province, northern Virginia: Geological Society of America Abstracts with Programs

Tollo, R.P., Aleinikoff, J.N., Borduas, E.A., and Hackley, P.A., in press, Petrologic and geochronologic evolution of the Grenville orogen, northern Blue Ridge province, Virginia, in Tollo, R.P., Corriveau, L., McLelland, J., and Bartholomew, M.J., eds., Proterozoic Tectonic Evolution of the Grenville Orogen in North America: Boulder, Colorado, Geological Society of America Memoir.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

Yes

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
0	10000

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
George Washington University	0